

Valve guides

Step settings and part no.	OD	Color code	Basic bore in cylinder head	Code number in cylinder head ¹⁾	Valve guide ID
intake	Standard dimension 110 050 25 24	14.016—14.023	green	14.000—14.006	1
		14.021—14.028	without	14.007—14.012	2
		14.026—14.033	brown	14.013—14.018	3
	Intermediate stage 110 050 26 24	14.034—14.040	gray-green	— ¹⁾	9.000—9.015
		14.039—14.046	gray	— ¹⁾	
		14.045—14.051	gray-brown	— ¹⁾	
	1st repair stage 110 050 27 24	14.216—14.233	red	14.200—14.218	
	2nd repair stage 110 050 28 24	14.416—14.433	white	14.400—14.418	
	Standard dimension 110 050 33 24	15.016—15.023	green	15.000—15.006	1
		15.021—15.028	without	15.007—15.012	2
		15.026—15.033	brown	15.013—15.018	3
exhaust 11 mm ϕ	Intermediate stage 110 050 34 24	15.034—15.040	gray-green	— ¹⁾	11.000—11.018
		15.039—15.046	gray	— ¹⁾	
		15.045—15.051	gray-brown	— ¹⁾	
	1st repair stage 110 050 35 24	15.216—15.233	red	15.200—15.218	
	2nd repair stage 110 050 36 24	15.416—15.433	white	15.400—15.418	
	3rd repair stage 110 050 37 24	16.2 (roughing dim.) ²⁾	—	16.000—16.018	
	Standard dimension 110 050 40 24	15.016—15.023	green	15.000—15.006	1
		15.021—15.028	without	15.007—15.012	2
		15.026—15.033	brown	15.013—15.018	3
	Intermediate stage 110 050 41 24	15.034—15.040	gray-green	— ¹⁾	9.000—9.015 ³⁾
		15.039—15.046	gray	— ¹⁾	
		15.045—15.051	gray-brown	— ¹⁾	
exhaust 9 mm ϕ	1st repair stage 110 050 42 24	15.216—15.233	red	15.200—15.218	
	2nd repair stage 110 050 43 24	15.416—15.433	white	15.400—15.418	
	3rd repair stage 110 050 44 24	16.2 (roughing dim.) ²⁾	—	16.000—16.018	

For overlap of valve guide in cylinder head refer to table: Association basic bore valve guide

¹⁾ After knocking-out valve guide, the basic bore is not essentially larger than the series basic bore. On exchange engines the basic bore is machined and does not correspond to series basic bore.

²⁾ For machining OD 16.016—16.033.

³⁾ Series (except emission-controlled engines) starting April 1978. Emission-controlled engines starting model year 1980.

Special tools




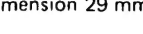


Master mandrel 9 mm dia. intake and exhaust

116 589 08 21 00

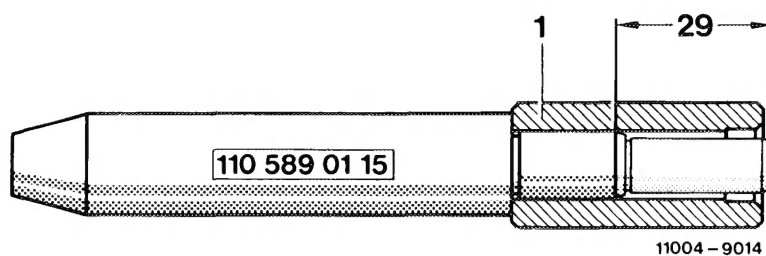


Master mandrel 11 mm dia. exhaust

116 589 09 21 00

Knock-out mandrel 9 mm dia. intake and exhaust		110 589 02 15 00
Knock-out mandrel 11 mm dia. exhaust		110 589 03 15 00
Knock-in mandrel 9 mm dia. intake		116 589 20 15 00
Knock-in mandrel 11 mm dia. exhaust ¹⁾		116 589 19 15 00
Reamer 8.99 mm dia. H 7 intake and exhaust		000 589 10 53 00
Reamer 10.99 mm dia. H 7 exhaust		000 589 15 53 00

¹⁾ Change former knock-in mandrel 110 589 01 15 00 according to following drawing, so that exhaust valve guides with 9 mm ID can also be knocked-in. Press-off sleeve (1), machine guide pin (dimension 29 mm), press sleeve (1) on again.



Conventional tool

Internal precision measuring instrument
8–12 mm dia.

e.g. made by Hommel, D-5000 Köln 71
Subito, order no. 33 830 103

Note

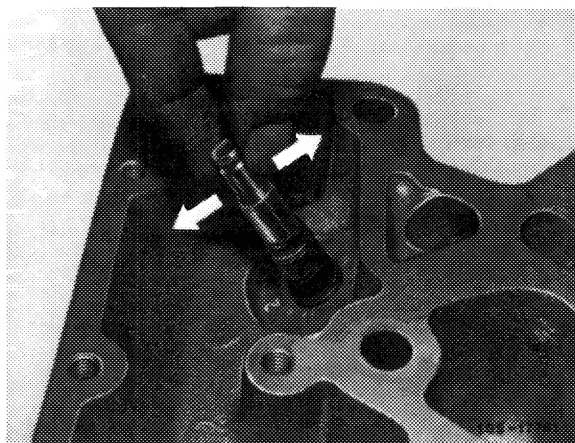
Valve guides which must be renewed due to wear, should permit installation in original basic bore in cylinder head without additional machining.

Valve guides which are loosely seated in cylinder head must be inserted in newly made basic bores.

Checking valve guide

Upon removal of valve spring and valve stem seal, the wear on valve guide can be determined in installed condition by moving valve stem predominantly cross-wise in relation to engine.

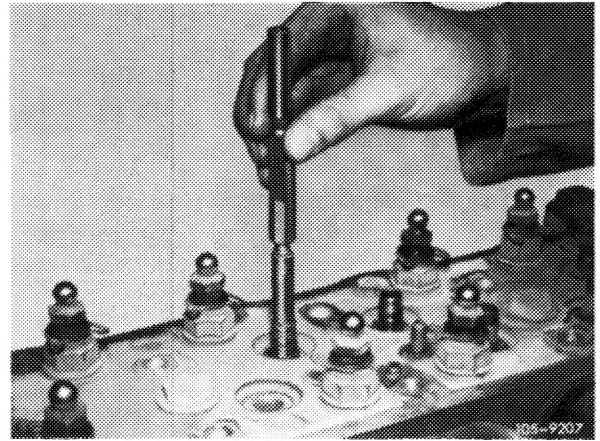
As a reference value, a max. wear of approx. 1.2 μm for 1000 km (0.12 mm for 100 000 km) should be assumed.



However, this value does not apply to upper and lower range of valve guide, since experience has shown that the wear at these points is higher.

Check valve guides with inspection mandrel and cylinder head disassembled.

Valve guides, which are worn outside on seat of valve stem seal, should be replaced, since the valve stem seal is no longer tightly seated.

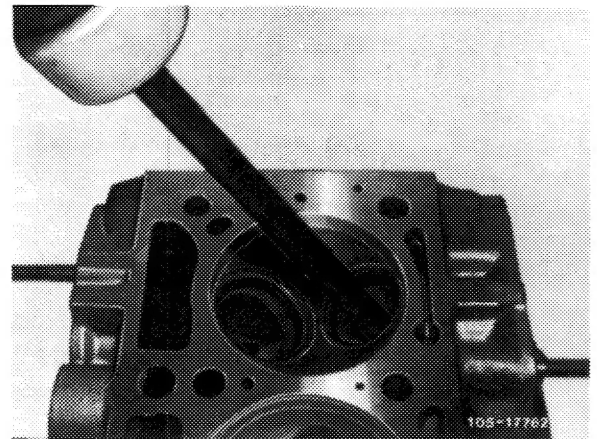


Assigning and inserting valve guides

1 Knock-out valve guide with knock-out mandrel from direction of combustion chamber or press out.

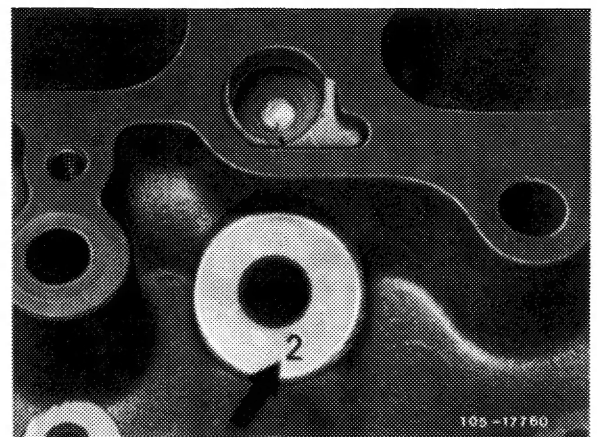
2 Visually check basic bore in cylinder head for score marks and deposits.

Equalize deposits (if any) by means of a small file.



Attention!

A basic bore with punched-in code number, e.g. 2 (arrow) should be associated with the respective valve guide with regard to the applied color code or the measured OD.



On **exchange engines** the basic bore in cylinder head is larger than normal. This means, that the punched-in code numbers in cylinder head are no longer in accordance with basic bores according to table.

In such a case, measure basic bore or OD of knocked-out valve guide prior to pertinent association.

Association of a valve guide with a not-refinished basic bore in cylinder head

Punched-in code number adjacent to basic bore in cylinder head ¹⁾	Color code of valve guide ²⁾	Overlap in cylinder head	Machining note
0	without	0.015—0.028	Knock-in valve guide with knock-in mandrel.
	brown	0.020—0.027	Undercool valve guide, knock-in with knock-in mandrel or heat cylinder head, knock-in with knock-in mandrel.
	gray-green ³⁾	0.028—0.040	Undercool valve guide, knock-in with knock-in mandrel, ream ID or heat cylinder head, knock-in, ream ID with reamer.
1	brown	0.019—0.026	Knock-in valve guide with knock-in mandrel.
	gray-green	0.022—0.033	Undercool valve guide, knock-in with knock-in mandrel or heat cylinder head, knock-in with knock-in mandrel.
	gray ³⁾	0.027—0.039	Undercool valve guide, knock-in with knock-in mandrel, ream ID or heat cylinder head, knock-in, ream ID with reamer.
2	gray-green	0.016—0.027	Knock-in valve guide with knock-in mandrel.
	gray	0.021—0.033	Undercool valve guide, knock-in with knock-in mandrel or heat cylinder head, knock-in with knock-in mandrel.
	gray-brown ³⁾ ⁴⁾	0.027—0.038	Undercool valve guide, knock-in with knock-in mandrel, ream ID or heat cylinder head, knock-in, ream with reamer.

1) After knocking-out valve guide, the basic bore is not essentially larger than the series basic bore.

On exchange engines the basic bore is machined and does no longer correspond to series bore.

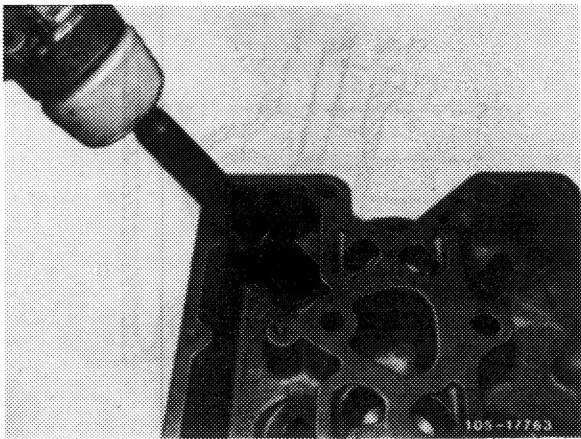
2) Valve guides with color code "green", overlap 0.010—0.023 mm, should not be used since they may become loose.

3) Use valve guides which require inside reaming after knocking-in, should be used only if no other valve guides are available.

4) Valve guide gray-brown with 0.027—0.038 mm overlap, may also be installed into cylinder head instead of a slightly loose valve guide without refinishing basic bore.

3 Insert valve guide for approx. 3–4 minutes into liquid oxygen, then insert **immediately** into knock-in mandrel and **immediately** into respective bore while following-up with a hammer.

Note: If the valve guide is not knocked-in immediately up to locking ring, it will absorb the temperature of the cylinder head and can then be completely knocked-in with considerable difficulty.



4 If no liquid oxygen is available, heat cylinder head in a water bath, e.g. a parts washing system or a heating oven to max. 80 °C (176 °F).

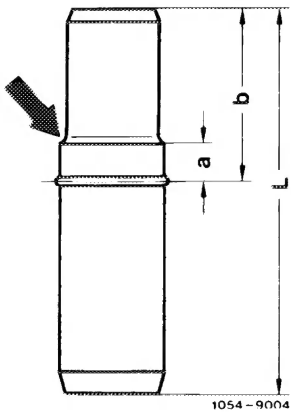
5 Coat valve guide with tallow and knock-in with knock-in mandrel until circlip or knock-in mandrel rests against cylinder head.

Attention!

Use specified knock-in mandrel only.

The stop in knock-in mandrel is adapted to valve guide and dimension a in such a manner that the valve guide can be knocked into end position without damage.

Intake valve guide



	Intake	Exhaust
a	5	7.5
b	23	20.5
L	51.5	54
ID	9	9 starting April 1978 starting (USA) 1980 11 up to April 1978 up to (USA) 1980

Exhaust valve guide

